CHAPTER 49
NONPUBLIC WATER WELLS – PERMITS AND CONSTRUCTION

[Prior to 7/1/83, Health Dept. Ch 45]
[Prior to 12/3/86, Water, Air and Waste Management[900]]

567—49.1(455B) Purpose. The purpose of this chapter is to protect the public health by protecting groundwater supplies from contamination by establishing uniform minimum standards and methods for nonpublic water supply well construction and reconstruction. This chapter provides minimum standards for installation of well pumps or equipment employed in withdrawing or obtaining water from a well for any use, except monitoring wells, including safeguards as may be necessary to protect from contamination the water in an aquifer and water being pumped from a well.

567—49.2(455B) Definitions, references, and abbreviations.

49.2(1) *Definitions.* In addition to the definitions in 567—Chapter 39, 567—Chapter 40, 567—Chapter 82, and Iowa Code sections 455B.101, 455B.171, 455B.190 and 455B.190A, which are hereby adopted by reference, the following definitions shall apply to this chapter:

"Administrative authority" means the county board of supervisors or its designee.

"Agreement" means a signed document between the department and the county board of supervisors with which the department delegates the authority to issue private well drilling permits to the county board of supervisors or its designee.

"Anaerobic lagoon" means an impoundment, the primary function of which is to store and stabilize organic wastes. The impoundment is designed to receive wastes on a regular basis, and the design waste loading rates are such that the predominant biological activity in the impoundment will be anaerobic. An anaerobic lagoon does not include:

1. A runoff control basin which collects and stores only precipitation-induced runoff from an open feedlot feeding operation; or
2. A waste slurry storage basin which receives waste discharges from confinement feeding operations and which is designed for complete removal of accumulated wastes from the basin at least semiannually; or
3. Any anaerobic treatment system which includes collection and treatment facilities for all off-gases.

"Annular space" means the open space between the well hole excavation and the well casing.

"Cesspool" means a covered excavation, lined or unlined, into which wastes from toilets or urinals are discharged for disposal. Cesspools are not an approved method of sewage disposal.

"Compensation for well interference" means payment to the owner of a nonregulated well for damages caused by a lowered water level in the well due to withdrawal of water for a permitted use.

"Confinement building" means a building used in conjunction with a confinement feeding operation to house animals.

"Conforming well" means a well that complies with the standards of this chapter, including wells properly plugged according to 567—Chapter 39.

"Contiguous" means any number of parcels of land that physically touch one another, including tracts of land separated by roads, railroads or streams, except that for the purpose of reporting on other existing wells on the property, the radius of a contiguous piece of land shall be limited to one mile from the site of the new well constructed.

"Contractor" is defined in Iowa Code section 455B.171(3). For the purposes of this chapter, the term also includes a corporation, partnership, sole proprietorship, association or any other business entity, and any employee or officer of the entity.

"DX" or *"Direct exchange geothermal"* is a type of GHEX loop system consisting of a ground-source heat pump that utilizes refrigerant circulating through copper pipe inserted into a borehole in the ground.

"DX heat transfer fluid" means a refrigerant complying with ANSI/ASHREA 34.

"Established grade" means the permanent point of contact of the ground to artificial surface with the casing or curbing of the well.

"GHEX" means ground heat exchange.

"GHEX loop boreholes" means ground heat exchange borehole(s); ground-coupled, closed-loop, heat exchange borehole(s); or any excavation 20 feet or greater in depth that is augered, bored, cored, drilled, driven, dug, jetted, washed, or is otherwise constructed into which a closed loop used for ground heat exchange is installed. A GHEX loop borehole is not a water supply well.

"GHEX loop borehole construction" means the excavation of the borehole, emplacement of the closed loop, grouting of the loop, and installation of the heat exchange fluid.

"GHEX loop system services" means any construction, installation, rehabilitation, repair, or plugging of the various components of the ground heat exchange systems including the borehole, piping, grout, and heat-exchange fluid.

"Grout" means a material used to seal the annular space between the casing and the borehole and shall consist of neat cement, concrete, high solids bentonite slurry, or hydrated bentonite chips.

"Health-related problem" means well water that contains any contaminant at a level that exceeds MCLs (maximum contaminant levels) or HALs (health advisory levels) as adopted by the department.

"Heavy drilling fluid" means water used for drilling which, because of the natural clay content of the borehole or by addition of bentonite grout, has a solids density of at least 10 percent by weight or a mud weight of at least 9.25 lb/gal.

"Inactive well" means a well which is not currently in use and is capped or sealed to prevent the entrance of contaminants into the well, but is in such a condition that it can be activated to produce a safe supply of water.

"Landowner" means an individual, trust, partnership, corporation, government or governmental subdivision or agency, association or other legal entity that has legal or equitable title to a piece of land.

"Landowner's agent" means a person who acts for or in place of the landowner by authority from the landowner.

"Low permeability material" means a geological unit of unconsolidated material (usually clay or till) or bedrock (usually shale) that is all or partially saturated, and having permeability low enough (10^{-7} cm/sec) to give water in the aquifer artesian head.

"Nonpublic water supply well" means a well that does not supply a public water supply system.

"Nonregulated well" means a well used to supply water for a nonregulated use (a use of water less than 25,000 gallons per day which is not required to have a water use permit).

"Open feedlot" means an unroofed or partially roofed animal feeding operation in which no crop, vegetation, or forage growth or residue cover is maintained during the period that animals are confined in the operation.

"Permitted use" means a use of water in excess of 25,000 gallons per day which requires a water use permit pursuant to 567—Chapters 50 through 52 and Iowa Code chapter 455B, division III, part 4.

"Pitless adapter" means a device designed for attachment to one or more openings through a well casing. It shall be constructed so as to prevent the entrance of contaminants into the well through such openings, conduct water from the well, protect the water from freezing or extremes of temperature, and provide access to water system parts within the well.

"Pitless unit" means an assembly which extends the upper end of the well casing to above grade. It shall be constructed so as to prevent the entrance of contaminants into the well, conduct water from the well, and protect the water from freezing or extremes of temperature, and provide full access to the well and to water system parts within the well. It shall provide a pitless well cap for the top terminal of the well.

"Private well" means a well that does not supply a public water supply system.

"Pumps and pumping equipment" means any equipment or materials, including seals, tanks, fittings and controls utilized or intended for use in withdrawing or obtaining water for any use.

"Runoff control basin" means an impoundment designed and operated to collect and store runoff from an open feedlot.

"Stuffing box" means an approved receptacle in which packing may be compressed to form a watertight or airtight junction between two objects.

"Upper terminus" means the upper 10 feet of the well casing as measured from the finished surface grade.

"Well" is synonymous with "water well" as defined in Iowa Code chapter 455B.171. The term does not include heat pump or geothermal heat exchange systems less than 20 feet deep or temporary dewatering wells in place for 7 days or less..

"Well construction" means constructing a well and installing necessary casing, screen, liners, grout, seals,

and other appurtenances.

"Well liner" means a pipe used to line the inside of a well hole but not designed to hold hydraulic or structural loading. Liners shall be installed within a casing or in an ungrouted open borehole.

"Well plugging" means the closure of an abandoned well with plugging materials by procedures which will permanently seal the well from contamination by surface drainage and permanently seal off the well from contamination into an aquifer. "Well plugging" includes the proper application of filling and sealing materials.

"Well reconstruction" means modification of the original construction of a well. "Well reconstruction" includes, but is not limited to, deepening the well, installing a liner, installing or replacing a screen with one of a different diameter or length, installing a pitless adapter, extending the casing, or hydrofracturing a well. Replacing a screen with one of identical diameter and length or replacing a pitless adapter is considered repair, not reconstruction.

"Well rehabilitation" means the physical or chemical cleaning of a well.

"Well seal" means a device used to cover or seal a well that establishes or maintains a junction between the casing of the well and the piping, electric conduit, or equipment installed, so as to prevent water or other foreign material from entering the well at the uppermost terminal.

1. "Well cap" means a snug-fitting, watertight device used above flood level that excludes dust and vermin and allows for screened venting.
2. "Sanitary seal" means a watertight fitting which uses mechanical compression that is installed on wells that terminate in a wellhouse.

49.2(2) *References and abbreviations.* The following standards references and abbreviations are used in this chapter:

a. References. The abbreviated name of the professional associations and societies whose standards are referenced in this chapter are listed in the following table. The website where the standards and guidance documents may be obtained is also provided in the table. The specific standards are set forth in specific rules of this chapter.

Abbreviated Name	Association/Society Name	Standards/Publications Website
API	American Petroleum Institute	https://www.api.org/products-and-services/standards/
ANSI/ASHRAE	American National Standards Institute/American Society of Heating, Refrigerating and Air-Conditioning Engineers	https://www.ashrae.org/technical-resources/standards-and-guidelines
ASME	American Society of Mechanical Engineers	https://www.asme.org/codes-standards
ASTM	Annual Book of Standards published by ASTM International	https://www.astm.org/products-services/standards-and-publications.html/
AWS	American Welding Society	https://www.aws.org/Standards-and-Publications/.
AWWA	American Water Works Association	https://www.awwa.org/Publications/Standards
NACE	National Association of Corrosion Engineers International, part of the Association for Materials Protection and Performance (AMPP)	https://www.ampp.org/standards/ampp-standards/about-ampp-standards
NEC	National Electrical Code, part of the National Fire Codes published by the National Fire Protection Association (NFPA)	https://www.nfpa.org/
NSF	National Sanitation Foundation	https://www.nsf.org/nsf-standards
NGWA	National Ground Water Association	https://www.ngwa.org/publications-and-news/industry-resource-library
WSC	Water Systems Council	https://www.watersystemscouncil.org/resources/well-standards/

b. Abbreviations. The following abbreviations are used in this chapter:

"ABS" means acrylonitrile-butadiene-styrene.

"DR" means dimension ratio.

"FDA" means the U. S. Food and Drug Administration.

"HDPE" means high-density polyethylene.

"HTH" means high test hypochlorite.

"psig" stands for pounds per square inch gauge.

"PVS" means polyvinyl chloride.
"SCH" means schedule, as in a SCH 40 rating.
"SDR" means standard dimension ratio.
"USP" means United States Pharmacopeia.

567—49.3(455B) Applicability. The provisions contained herein apply to the construction and reconstruction of all nonpublic water supply wells. Ponds and surface water supplies are not covered by these rules. Information regarding use of water supplies should be sought from the administrative authority prior to use.

49.3(1) *Nonconforming well construction installations.*

a. Certified well drilling contractors shall ensure that the reconstruction of nonconforming wells adheres to all applicable provisions of this chapter or to comparable construction or installation requirements approved by the administrative authority.

b. When any construction or reconstruction is done on a nonconforming feature of a well, that feature shall be upgraded and brought into compliance with the material and installation standards in this chapter.

49.3(2) *Nonconforming water system installations.*

a. Certified pump installers shall ensure that the reconstruction or repair of nonconforming water systems adheres to all applicable provisions of this chapter or to comparable construction or installation requirements approved by the administrative authority.

b. When pump services are to be performed on a well that has a contamination problem, the well shall be upgraded and brought into compliance with installation standards in this chapter.

c. When pump services are to be performed on a well that does not have a contamination problem, the well may be put back into service with nonconforming features. However, the certified installer shall notify the well owner in writing of the defects and include recommendations to correct these deficiencies.

49.3(3) *Construction permit required.*

a. In accordance with Iowa Code section 455B.187(2), a landowner or landowner's agent shall not drill or construct a new private well without first obtaining a well construction permit from the department or a County authorized to issue permits pursuant to this chapter. Examples of private wells requiring well construction permits include, but are not limited to: domestic wells, livestock wells, irrigation wells, recreational-use wells, monitoring wells, heat pump wells, horizontal and lateral geothermal wells 20 feet or greater in depth, industrial wells, and dewatering wells. With the exception of driven, direct push, sandpoint, and dewatering wells, wells that do not have a minimum of 20 feet of solid casing are not permitted.

b. A private well construction permit is required for all replacement wells and for modification of the physical dimensions of a well.

49.3(4) *Exemptions.*

a. This chapter shall not apply to public water supply wells; dewatering wells; heat pump wells or horizontal and lateral geothermal wells that are less than 20 feet in depth; elevator shafts; underground storage tank monitoring wells covered under 567—Chapter 135; or monitoring wells for solid waste disposal facilities covered in 567—Chapter 110.

b. Dewatering wells shall be exempt from the construction standards of this chapter.

c. Private well construction permits are not required for: temporary test holes or wells that are in place for seven consecutive days or less and are used to assess groundwater; soil borings; mineral, rock, gas, and other non-groundwells or exploration boreholes; and all monitoring wells required as part of a permit or a construction approval issued by the department.

567—49.4(455B) General.

49.4(1) The administrative authority shall:

a. Have the authority to visit well sites during any phase of the work without prior notice, and

b. Require the issuance of permits and the submission of well logs by rule.

49.4(2) The administrative authority may also require posting of performance bonds and collection and submission of other data.

49.4(3) No well construction or reconstruction shall be initiated until a permit has been issued by the proper

authority. Construction permit issuance covered by this chapter shall be coordinated with water withdrawal permits issued by the department, pursuant to 567—Chapter 50.

49.4(4) All well services shall be performed by a certified well contractor or the property owner as specified in 567—Chapter 82.

49.4(5) It shall be the responsibility of the certified well contractor to ensure that a well construction permit has been issued prior to initiation of well construction or reconstruction, and to ensure that all well services are performed in accordance with this chapter.

567—49.5(455B) Private well construction permit applications and fees.

49.5(1) *Application forms.*

a. An application for a private well construction permit shall be made on forms provided by the department. However, counties that have active delegation of authority to issue new private well construction permits pursuant to rule 567—49.7(455B) may develop and use their own application forms, subject to department approval.

b. Each application shall list all wells, including non-plugged abandoned wells, on the applicant's property contiguous to the well site described in the application and shall describe the location of each well site. The location shall be given as a legal land description (section, township and range) to the nearest quarter of a quarter of a quarter of a section, or as a latitude and longitude in degrees to four decimal accuracy.

c. A proper application shall consist of a fully and properly completed form and nonrefundable fee.

49.5(2) *Application fees.*

a. Each application for a private well construction permit shall be accompanied by a nonrefundable fee of $125 payable to the Department of Natural Resources, unless a county board of supervisors or the board's designee is authorized to issue private well construction permits pursuant to rule 567—49.7(455B).

b. In cases where the permitting authority is delegated to the county, the county board of supervisors may set a different fee and designate the terms for fee payment, and shall submit to the department a permit fee of $25 per application. This $25 fee shall be submitted quarterly by the counties in a manner provided by the department.

c. More than one proposed well for the same use on one contiguous piece of property of less than ten acres may be listed on one application and only one fee need be paid irrespective of the number of wells listed on the application form. Additional wells on the same property at a later time shall require another permit. Separate permits are required for individual wells and geothermal systems that are not interconnected and supply or will supply separate domestic dwellings.

d. The department is exempt from the fee payment requirements to the counties. The department shall remit fees directly to the department's private well permit program fund.

567—49.6(455B) Private well construction permit issuance, conditions, expiration, and denial.

49.6(1) *Issuance.* Upon receipt of a complete application, the department or contracting county shall issue a private well construction permit to the landowner or landowner's agent, except as provided in subrule 49.6(6).

49.6(2) *Not a water withdrawal permit.* Each permit shall include notification that a private well construction permit is not a water withdrawal permit and does not eliminate the necessity of obtaining any water withdrawal permits required in 567—Chapters 50 and 53 through 55 for water withdrawal in excess of 25,000 gallons of water per day from any source or combination of sources in the state of Iowa.

49.6(3) *Construction by certified well contractor.* Each well construction permit shall require that each well be constructed by a certified well contractor in compliance with this chapter and 567—Chapter 82.

49.6(4) *Transferability.* A private well construction permit is not transferable**.**

49.6(5) *Expiration.* A private well construction permit shall expire one calendar year from the date of issuance. If construction of the proposed well is not started prior to the expiration date, a new application plus a new nonrefundable fee must be filed with the department or the county board of supervisors pursuant to subrule 49.5(2).

49.6(6) *Permit denial.* The department or contracting county may deny a private well construction permit in the following circumstances:

a. If granting the permit would lead to the violation of state law, could result in groundwater contamination, or would lead to withdrawal from a protected source;

b. If the well could threaten public health or the environment; or

c. If the well would be an underground injection well, except as provided in subrule 567—50.6(4).

49.6(7) *Appeal of permit denial.* Any applicant aggrieved by a decision issued under the provisions of this chapter may file a notice of appeal with the director. The notice of appeal must be filed within 30 days of the date of the permit decision. The form of the notice of appeal and appeal procedures are governed by 561—Chapter 7. Appeal of a permit denied by a county which has been delegated authority to issue private well construction permits shall be administered by the county in accordance with its appeal or judiciary review process. Appeal to the department is possible only when the appeal involves well design or construction variances or if delegation to the county is suspended, rescinded, or revoked.

567—49.7(455B) Delegation of construction permitting authority to a County.

49.7(1) *Application.* A county board of supervisors, board of health, or the board's designee, hereafter referred to as a "County," requesting the authority to issue private well construction permits shall enter into an intergovernmental (28E) service agreement with the department in accordance with Iowa Code chapter 28E. The agreement shall be signed by the department and the County and include statements complying with this chapter and 567—Chapter 39. Additional information supporting an application may be requested by the department. The department may contract for all or part of the private well permitting services in those counties that do not receive or maintain delegation authority or for permit authorities retained by the department.

49.7(2) *Information to the department.* The delegation agreement shall provide for the method, format, and frequency of reporting all permit application information and remission of fees to the department.

49.7(3) *Authority.* After delegation of authority to a County, all applications in that county shall be made to the board or its designee, except that all new private well construction permit applications by state or federal agencies shall be made to the department.

49.7(4) *Delegation term.* A delegation of authority may be for up to five years and may be redelegated at the discretion of the department.

49.7(5) *Permit number.* Each permit shall be given a unique number as prescribed by the department. This numbering system shall be consistent throughout the state.

49.7(6) *Emergency permits.* Contracting counties must have policies and procedures in place to accommodate the issuance of permits on an emergency basis for the immediate replacement or reconstruction of wells in response to the sudden and unforeseen loss or serious impairment of a well for its intended use.

49.7(7) *Delegation agreement revocation.* The department may revoke a County delegation agreement if the board of supervisors or its designee failed or refused to carry out the provisions of this chapter in a timely manner or violated any of the provisions of the delegation agreement with the department.

567—49.8(455B) Well location. Wells shall be located with consideration given to the lot size; contour, porosity, and absorbency of the soil; local groundwater conditions; flooding; and other factors necessary to implement the rules. The lack of specific distances to other possible sources of contamination, such as refuse disposal sites or high-pressure gas lines, does not minimize their potential hazard. Other possible sources shall be evaluated in each particular situation and a distance arrived at that is based on pertinent facts. The well contractor shall consult the administrative authority for assistance in determining a proper distance in such cases.

49.8(1) *Minimum distances.* The following minimum lateral separation distances from all private wells shall apply for the common structures or sources of contamination listed in the following table.

Table 49.8(1) Minimum Lateral Separation Distances, Private Wells

Structure or Source of Contamination	Minimum Lateral Distance (feet)	
	Shallow Well[1]	Deep Well[1]
Public water supply well	400	200
Animal waste storage tank, animal waste stockpiles confinement building, feedlot solids settling facility, open feedlot	200	100
Transmission pipelines (including, but not limited to, fertilizer, liquid petroleum, or	200	100

anhydrous ammonia) if a more restrictive setback is not set by the pipeline owner	
	All Private Wells
Animal waste storage basin or lagoon, runoff control basins and anaerobic lagoons (see subrule 49.8(2) below)	1000
Drainage wells	1000
Solid waste landfills and disposal sites[2]	1000
Treatment Works[3]	400
Preparation or storage area for spray materials, commercial fertilizers, or chemicals that may result in groundwater contamination	150
Existing wells that do not conform to this chapter	100
Liquid hydrocarbon storage tanks, except for liquid propane gas (LPG)	100
Private sewage disposal systems – open portion of treatment system4	100
Private sewage disposal systems – closed portion of treatment system4	50
Public sanitary sewers (gravity or force mains) made with standard sewer materials	50
Public sanitary sewers (gravity or force mains) made with water main materials	25
Flowing streams or other surface water bodies	25
LPG storage tanks	15
Roadside ditch and road rights-of-way	15
Existing wells that conform to this chapter	10
Building sewer service lines and laterals, storm sewers, independent clear water drains, cisterns, well pits, or pump house floor drains	10
Yard hydrants	10
Frost pit	10
Property lines (unless a mutual easement is signed and recorded by both parties)	4

[1] "Deep well" and "shallow well" are defined in 567—40.2(455B).

[2] Solid waste means garbage, refuse, rubbish, and other similar discarded solid or semisolid materials, including but not limited to such materials resulting from industrial, commercial, agricultural, and domestic activities.

[3] Treatment works is defined in Iowa Code section 455B.171. The separation distance in this table shall apply unless an exception is provided in 567—paragraph 64.1(2)"c."

[4] Private sewage disposal system is defined in 567—subrule 69.1(2). Open portions of treatment systems include subsurface absorption systems, mound systems, intermittent sand filters, constructed wetlands, and open bottom media filters. Closed portions of treatment systems include septic tanks, aerobic treatment units, fully contained media filters, and impervious vault toilets.

49.8(2) *Minimum distance exception.* The minimum lateral separation distance between a well and an anaerobic lagoon, earthen manure slurry storage basin, earthen manure storage basin, or runoff control basin shall be 400 feet if the applicant demonstrates through percolation testing that the seepage loss through the lagoon or basin does not exceed 1/16 inch per day (0.0625 inch/day). The percolation test shall meet the requirements of ASTM D1587/D1587M-15 and 567—subrule 65.15(11).

49.8(3) *Frost pits.* Wells cannot be located within frost pits. Frost pits that do not contain wells are allowed for the purpose of housing other appurtenances, such as pressure tanks and valves, provided the frost pits are not located closer than 10 feet from any well.

49.8(4) *Relation to buildings.* Wells shall be located so that no building interferes with reasonable access for cleaning, treatment, repair, testing, inspection, or other maintenance. Wells cannot be located in basements.

49.8(5) *Easements.* No well shall be located on a property not owned by the well owner unless an easement allowing such placement is reviewed and approved by the administrative authority and the easement is legally recorded.

567—49.9(455B) General construction requirements. Wells shall be planned and constructed to adapt to the geologic and groundwater conditions of the proposed well site to ensure both the reasonable utilization of every natural protection against contamination of the water-bearing formation(s) and the exclusion of possible sources of contamination, to attempt to produce bacterially safe water free of health-related problems.

49.9(1) *Water used in construction.* Water used in the construction process shall be obtained from a potable water source that will not result in well contamination. Drilling water shall be treated with 3 pints of 5.25 percent sodium hypochlorite solution per 100 gallons of water, 0.25 pounds of 65 percent calcium hypochlorite per 100 gallons of water, or other additives to produce an equivalent concentration of chlorine residual (50 ppm).

49.9(2) *Wellhead.*

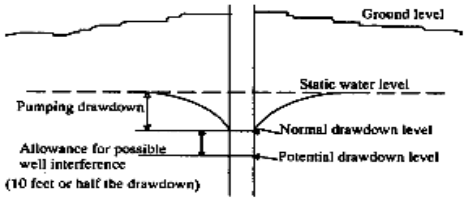
a. The upper terminal casing of all wells shall extend at least 12 inches above established grade or pump house floor, or the 100-year flood level, whichever is higher. A well cap or sanitary seal shall be installed immediately following well completion. A well cap shall be used on an exposed well; a sanitary seal only on a well terminating within a wellhouse. Any openings in the cap or seal, such as for pump wiring or water depth measurement, shall be properly grommeted or sealed, except for properly screened and oriented vent openings.

b. The ground surface immediately adjacent to the well casing shall be compacted and graded so that surface water is diverted away from the casing. Well platforms are not recommended, except those used as pump house floors.

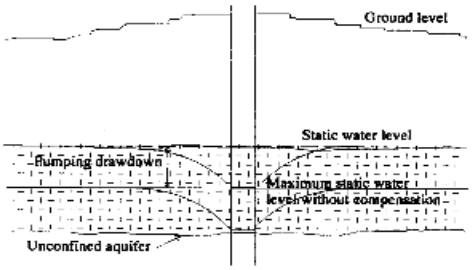
49.9(3) *Criteria for well interference protection.* 567—Chapter 54 provides an administrative process for owners of nonregulated wells to receive compensation for well interference caused by permitted uses. To be eligible for compensation due to well interference, nonregulated wells shall be constructed to allow for some potential well interference.

a. Allowance for potential well interference is accomplished by constructing a nonregulated well to anticipate a lowering of the static head of the well which may be caused by interference from a nearby permitted use well.

(1) A well shall be drilled deep enough to allow for pump setting at least 10 feet or half the normal pumping drawdown, whichever is greater, below the initial recommended setting depth.

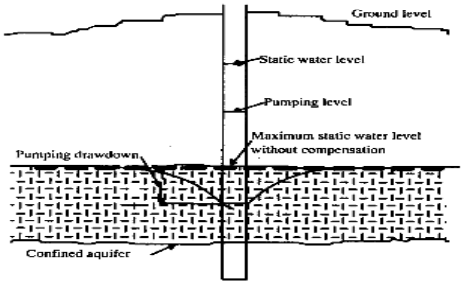


(2) If a well draws from an unconfined aquifer, the static water level may drop to half the saturated thickness of the aquifer before well interference is considered, if the calculation in *"a"* above should indicate a shallower depth. Shallow aquifers that are only slightly confined may be classified as unconfined aquifers for this purpose.



(3) Where a well penetrates a confined aquifer, the static water level is protected only to the top of the aquifer if the calculation in *"a"* above should indicate a deeper level.

(4) Protected levels for flowing wells will be considered the top of the confined aquifer or 100 feet below the surface, whichever is higher. Flowing wells shall be constructed to accommodate a pump capable of supplying a sufficient water supply at protected levels.



(5) The well design also needs to consider drought and reduced well efficiency. Additional information is provided in 567—Chapter 54.

b. A well that is used to withdraw more than 25,000 gallons of water per day requires a water use permit from the department. Upon obtaining such a permit, the well is considered a permitted use.

(1) If a permitted use exists prior to the construction of a well without a water use permit, no compensation for well interference will be allowed unless a significant change in the permitted use occurs.

(2) A physical change to withdrawal facilities may be considered a significant change to a permitted use (e.g., moving the withdrawal location, installing a new well, or installing a higher capacity pump).

(3) A person desiring to construct a well not requiring a water use permit should first obtain information concerning nearby permitted use wells. The department shall provide information on permitted use wells upon request.

49.9(4) *Access port for measurement of water levels.* Permitted use wells shall be equipped with an access port having a minimum diameter of ¾ inch. The access port shall be fitted with a threaded cap or plug and be located to allow insertion of a steel tape or electric probe into the well for water level measurements. When a spool type of pitless adapter is used which obstructs clear access to the water, a ¾-inch pipe shall be attached to the spool and brought to the surface below the well cap to allow water level measurements. Wells not requiring a water use permit should be constructed with an access port for water level measurement for possible future well interference concerns.

49.9(5) *Interconnection of aquifers.* Permitted use wells shall use casing and grouting to maintain a hydraulic separation between distinct aquifers separated by confining intervals. Hydraulic separation of distinct aquifers for non-permitted use wells is not required, however, caution should be taken to prevent aquifer contamination, and the administrative authority shall be consulted for possible local regulations when interconnection of aquifers across confining intervals is anticipated.

567—49.10(455B) Types of well construction.

49.10(1) *Drilled wells.*

a. Non-bedrock wells.

(1) Casing depth. In no case shall less than 20 feet of permanent solid casing be installed in wells drilled in unconsolidated materials. If the alluvial aquifer where the water is to be drawn from is covered by less than 40 feet of low permeability materials, the well screen shall be set at the bottom of the water-bearing aquifer or at least 60 feet from the surface. Deeper depths may be required if nitrate contamination is excessive. If more than 40 feet of low permeability materials are present above the aquifer, the casing shall extend down at least to the top of the aquifer.

(2) Grouting.

1. Grout shall be placed to a minimum depth of 40 feet or along the full length of the casing where less than 40 feet of casing is set. Grouting the full length of the casing below 40 feet may be necessary to isolate any contaminated water lenses or aquifers.

2. If a layer of low permeability material at least five feet thick is encountered less than 40 feet from the surface, the grout may be terminated no less than five feet below the top of this low permeability material, but in no case less than 20 feet from the ground surface.

3. Grout shall be placed in accordance with subrule 49.11(3), except when driving casing. When driving casing, a cone-shaped depression or temporary outer casing that is filled with bentonite products must be maintained around the well casing. The bottom of the driven casing shall be equipped with a drive shoe.

(3) Annular space.

1. The borehole diameter shall be at least three inches greater than the outside diameter of the well casing to the minimum grouting depth.

2. When steel well casing pipe is installed using percussion methods, the annular space shall be at least five inches greater than the outside diameter of the well casing to a minimum depth of 25 feet.

(4) If the depth of casing is greater than 40 feet, the annular space below 40 feet may be filled with heavy drilling fluid taken from the borehole as long as the top 40 feet of annular space is properly grouted. In this case, the annular space below 40 feet shall be kept as small as possible to avoid settling.

b. Bored and augered non-bedrock wells with concrete, fiberglass, or clay tile casing. The casing shall be at least 18 inches in diameter and buried-slab construction is required.

(1) Casing.

1. The top of the concrete, fiberglass, or vitrified clay pipe casing shall be terminated not less than 10 feet below ground surface and extend to a minimum depth of 20 feet.

2. Casing shall be fitted with a reinforced concrete or steel plate, into which a watertight steel or thermoplastic casing is firmly embedded in or connected to a pipe that is cast or welded into the plate.

3. Casing shall be at least five inches in diameter and shall extend from the plate to not less than 12 inches above established grade or the 100-year flood level, whichever is higher.

4. A pitless adapter shall be installed below frost depth on newly installed plastic or steel casing.

(2) Backfilling annular space. A 12-inch grout seal shall be poured over and around the plate. The annular

space between the steel or thermoplastic casing and the borehole shall be backfilled with clean compacted soil free of debris or large organic material. During the backfilling process, the earth shall be thoroughly tamped to minimize settling. Grading around the well shall then be accomplished in accordance with subrule 49.9(2).

c. Bedrock Wells.

(1) Casing depth. Casing shall extend to a depth of at least 40 feet and be seated in firm rock. When the uppermost bedrock consists of creviced limestone or dolomite that does not produce water, the casing shall extend through the creviced formation, be seated in firm rock, and be properly grouted.

(2) Grouting.

1. For bedrock wells, full-length grouting of the casing is strongly recommended. Grout shall be placed to a minimum depth of 40 feet in accordance with subrule 49.11(3), except when driving casing using percussion or casing-hammer/rotary drilling.

2. When driving casing, a cone-shaped depression or temporary outer casing that is filled with bentonite products shall be maintained around the outside of the casing. The bottom of the driven casing shall be equipped with a drive shoe.

3. If a layer of low permeability material at least five feet thick is encountered less than 40 feet from the surface, the grout may be terminated no less than five feet below the top of this low permeability material, but in no case less than 20 feet from the ground surface.

4. Where local conditions warrant, the administrative authority may require more extensive grouting to protect any aquifer(s) that are penetrated.

(3) Annular space.

1. The borehole shall be at least three inches greater than the outside diameter of the well casing for the upper 40 feet or the minimum grouting depth.

2. When steel casing pipe is installed using percussion, or casing-hammer/rotary methods, the annular space shall be at least five inches greater than the outside diameter of the well casing to a minimum depth of 25 feet.

3. When bedrock wells are full-length pressure-grouted through the casing, the borehole diameter shall be three inches larger than the outside diameter of the casing for the minimum depth of at least 25 feet.

(4) If the depth of casing is greater than 40 feet, the annular space below 40 feet may be filled with heavy drilling fluid taken from the borehole as long as the top 40 feet of annular space is properly grouted. In this case, the annular space below 40 feet shall be kept as small as possible to avoid settling.

(5) In fractured rock, where circulation of slurry cannot be maintained, grouting may be done with bentonite chips. The chips shall be hydrated with one gallon of water per bag of bentonite.

49.10(2) *Driven, direct push, and sandpoint wells.* Well construction in sandy areas with a high water table is not recommended for potable water supplies. These types of wells shall meet the requirements of this chapter, except for casing depth and grouting requirements.

49.10(3) *Flowing artesian wells.*

a. Drilling operations shall extend into but not through the formation confining the water. The casing shall be installed and the annular space full-length pressure-grouted and allowed to set. After the grout is set, the drill hole shall be extended into the confined water-bearing formation.

b. Flow control from the well shall be provided by valved pipe connections or a receiving tank set at an altitude corresponding to that of the artesian head. Under no circumstances shall the water flow uncontrolled to waste.

c. A direct connection between the discharge pipe and a receiving tank, sewer, or other source of contamination is prohibited.

567—49.11(455B) Material standards. All materials utilized in well water construction shall conform to the standards and guidance of the AWWA, API, ASTM, and NGWA, except as modified by this rule.

49.11(1) *Well casing.*

a. Steel well casing and couplings.

(1) Steel well casing pipe shall have the weights and dimensions specified in Table 49.11(1)*"a"*(4). Well casing pipe shall be new steel pipe meeting one of the following standards:

1. ASTM A53/A53M-22,

2. ASTM A106/A106M-19a,
3. ASTM A589/A589M-06 - Type I, II or III,
4. API SPEC 5CT (11th Edition, December 2023),
5. API SPEC 5DP (2nd Edition, May 2020), or
6. API SPEC 5L (46th Edition, April 2018).

(2) Each length of casing shall be legibly marked in accordance with API or ASTM marking specifications with the manufacturer's or processor's name or trademark, size in inches, weight in pounds per foot, whether seamless or welded (type of weld), and the API or ASTM specification or trade monogram.

(3) All casing pipe joints shall be watertight welded construction or threaded couplings.

(4) Minimum casing pipe and coupling weights and dimensions are as follows:

Table 49.11(1)*"a"*(4) Minimum Casing Pipe and Coupling Weights and Dimensions

Size (inches)	Weight (lbs/ft)		Pipe				Couplings	
	Threads & Coupling	Plain End	Thickness (inches)	External Diameter (inches)	Internal Diameter (inches)	Threads per inch	External Diameter (inches)	Length (inches)
1	1.70	1.68	.133	1.315	1.049	11-1/2	1.576	2-3/4
1-1/4	2.30	2.27	.140	1.660	1.380	11-1/2	1.900	2-3/4
1-1/2	2.75	2.72	.145	1.900	1.610	11-1/2	2.200	2-3/4
2	3.75	3.65	.154	2.375	2.067	11-1/2	2.750	3-3/8
2-1/2	5.90	5.79	.203	2.875	2.469	8	3.250	3-15/16
3	7.70	7.58	.216	3.500	3.068	8	4.000	4-1/16
3-1/2	9.25	9.11	.226	4.000	3.548	8	4.625	4-3/16
4	11.00	10.79	.237	4.500	4.026	8	5.200	4-5/16
5	15.00	14.62	.258	5.563	5.047	8	6.296	4-1/2
6	19.45	18.97	.280	6.625	6.065	8	7.390	4-11/16
6-5/8 OD	20.00	19.49	.288	6.625	6.049	8	7.390	4-11/16
7 OD	20.00	19.54	.272	7.000	6.366	8 R	7.657	4-11/16
8	29.35	28.55	.322	8.625	7.981	8	9.625	5-1/16
10	41.85	40.48	.365	10.750	10.020	8	11.750	5-9/16
12	51.15	49.56	.375	12.750	12.000	8	14.000	5-15/16
14 OD	57.00	54.57	.375	14.000	13.250	8	15.000	6-3/8
16 OD	65.30	62.58	.375	16.000	15.250	8	17.000	6-3/4
18 OD	73.00	70.59	.375	18.000	17.250	8	19.000	7-1/8
20 OD	81.00	78.60	.375	20.000	19.250	8	21.000	7-5/8

R = Round Threads

b. Thermoplastic casing and couplings.

(1) Materials. Thermoplastic well casing pipe and couplings shall:

1. Be new PVC or ABS material having a minimum pressure rating of 200 psi and meeting one of the following standards: ASTM F 480-12, ASTM D2241-09, AWWA C-900-16, or ASTM 1785-21; and

2. Have an SDR of 21, 17, or 13.5, a DR of 18 or 14, or a SCH 40 or 80 rating, depending upon the specification.

(2) Potable water standards. The thermoplastic well casing pipe, pipe couplings, cement, primer, and other components shall be approved for well casing pipe in potable water supplies by the NSF 61-2016 or the health effects portion of NSF 14-2012 as they relate to well casing pipe, or an approved equivalent organization.

(3) Markings. Each length of casing shall be legibly marked with the manufacturer's or processor's name or trademark, the size in inches, and the ASTM F 480 specification or trade monogram.

(4) Casing joints. Thermoplastic pipe shall be assembled with either flush-threaded joints, integral-bell, solvent-cemented joints, one-piece solvent-cemented couplings, or a nonmetallic restrained joint system in accordance with ASTM F 480-12.

(5) When cement grout is used with thermoplastic casing, the manufacturer's specifications for use shall be followed, except in the top 40 feet.

(6) Thermoplastic pipe extending above ground shall be protected from ultraviolet light exposure.

(7) Under no circumstances shall thermoplastic well casing be driven.

49.11(2) *Grouting guides.* Casing that is to be grouted shall have a minimum of two sets of centering guides attached to the casing to allow for unobstructed flow and deposition of grout.

49.11(3) *Grouting materials and procedures.*

a. Concrete grout. A concrete grout mixture shall consist of cement, sand aggregate, and water, in the proportion of one bag cement (94 lbs.) and an equal volume of aggregate to not more than six gallons of clean water. Concrete grout shall not be used below the water table. Admixtures to reduce permeability or control setting time shall meet ASTM C 494-19. Concrete grout may be used with administrative authority permission where large void spaces need to be filled.

b. Neat cement grout. The mixture shall consist of one bag of cement (94 lbs.) to not more than six gallons of clean water. Admixtures to reduce permeability or control setting time shall meet ASTM C 494-19.

c. Bentonite grout. This grout is a mixture of water and commercial sodium-bentonite clay manufactured for the purpose of well grouting. Mixing shall be per manufacturer's specifications. Sodium-bentonite mixtures that have high viscosity but contain less than 10 percent solids are designed for drilling purposes and shall not be used as grout. Organic polymers used in grout mixtures shall meet NSF 60-2016.

d. Exclusion. Drilling fluids and cuttings may not be used as grouting material.

e. Application. Grouting shall be performed by pumping the mixture into the annular space from the bottom upward through the casing or through a tremie pipe until the annular space is filled. Grouting shall be done in one continuous operation, if possible. The bottom of the tremie pipe shall remain submerged in grout while grouting.

f. Exceptions. If buried-slab, percussion, or casing-hammer/rotary methods are used to construct a well, grouting shall be performed in accordance with subrules 49.10(1) and 49.10(2). If slurry circulation cannot be maintained, grouting shall be performed in accordance with subparagraph 49.10(1)*"b"*(5).

567—49.12(455B) Well reconstruction. All well reconstruction shall meet the requirements of this chapter. If the well feature in need of reconstruction cannot be brought into compliance with these rules, the well shall be properly plugged.

49.12(1) *Liner installation.* If reconstruction will involve the placement of a liner, a certified well contractor shall determine whether or not the proposed reconstruction will be done in order to correct a health-related problem. Based on the determination, the reconstruction shall be performed in accordance with paragraph *"a"* or *"b"* below.

a. Standards for liner installation to correct a health-related problem.

(1) The liner shall:

1. Have a minimum of two sets of centering guides to allow the proper placement of grout, and

2. Extend to the ground surface or top of the pitless adapter.

(2) In no case shall the liner be driven into place.

(3) The annular space between the old casing and the liner shall be pressure-grouted in place throughout its entire length using an approved grout.

b. Standards for liner installation to correct a problem that is not health-related.

(1) The liner shall extend at least ten feet above the static water level or, if a caving zone is present, shall extend above this region.

(2) The liner may be pressure-grouted in place if there is a sufficient annular space for proper grout application.

c. Liner material standards. Liners shall meet the well casing standards in subrule 49.11(1). Liners may be composed of either steel or thermoplastic with a minimum inside diameter of four inches. Steel liners shall be new and have a minimum wall thickness of .188 inches. Plastic liners shall have an SDR of 26 or less or be SCH 40 or SCH 80. If the installation does not meet the definition of a liner, casing material shall be used.

49.12(2) *Upper terminus.* All well reconstruction performed on the upper terminus of a well shall meet the standards of this chapter.

567—49.13(455B) Drilling mud disposal. Drilling fluid and mud remaining after construction of a well shall

not be disposed of in a stream or storm sewer; nor shall these materials be discharged into a sanitary sewer without permission of the owner and operator of the wastewater treatment facility.

567—49.14(455B) Pumps, pumping equipment, and wiring.

49.13(1) *General pump installation requirements.* Pump installation shall be planned and carried out so the pump will be:

a. Installed so that it and its surroundings are not exposed to chemical or biological contamination;

b. Properly sized so as to provide the volume of water necessary, where obtainable, for an adequate water supply;

c. Designed to meet the well characteristics and not exceed the yield of the well, except for low yield seepage/storage wells;

d. Installed without repriming or breaking suction;

e. Installed in a manner that provides adequate protection against contamination of the water supply from any surface or subsurface sources; and

f. Accessible for maintenance, repair, and removal.

49.14(2) *Lubrication.* Pump motor lubricant or coolant oil shall be NSF H1 approved or be FDA Generally Recognized As Safe (GRAS)-approved for incidental food contact.

49.14(3) *Other power pumps.* Other power pumps located over the well shall be mechanically joined to the casing or on a pump foundation or stand in a manner that effectively seals the top of the well. A sanitary seal shall be used where the pump is not located over the well, and the pump delivery or suction pipe emerges from the top.

49.14(4) *Hand pumps or similar devices.*

a. A hand pump, hand pump head, hand pump stand, or similar device shall be constructed so that there are no openings into the interior of the pump or well casing where rain or surface water, dirt, insects, or animals, or other foreign matter can enter.

b. Hand pumps shall:

(1) Be provided with a casing vent as described in subrule 49.17(2),

(2) Have a closed, downward-directed spout and a sealed pump rod packing assembly, and

(3) Be attached to a well casing by a sealed flange or other method approved by the administrative authority. The flange shall not be less than 12 inches above a concrete slab or the ground surface.

c. Where a well casing functions as a hand pump cylinder wall, the plunger shall not be less than 25 feet below the ground surface. Casing wall weep holes are not allowed.

49.14(5) *Pump wiring.* Pump wiring within the well shall be double-jacketed copper wire and meet the NEC specifications for wire sizing, unless the pump manufacturer requires a non-jacketed wire. Wire outside of the casing shall meet NEC specifications, at a minimum. Wire shall be secured to the drop pipe at a minimum of 20-foot intervals.

567—49.15(455B) Drop pipe.

49.15(1) *Discharge pipe.* Galvanized, black, or stainless steel drop pipe shall be minimum SCH 40 wall thickness. PVC drop pipe shall be minimum SCH 80 wall thickness. SCH 80 machined PVC, brass, or stainless steel couplings shall be used with PVC pipe. Polyethylene drop pipe shall meet the minimum specifications of ASTM D3350-21. Only brass or stainless steel fittings can be used on polyethylene drop pipe. If polyethylene drop pipe is used, the outside diameter of the pump shall be at least one inch smaller than the inside diameter of the well casing.

49.15(2) *Check valve.* For potable water installations, all pumps shall have a check valve within 20 feet of the pump for pump installations without drain-back aeration. For pump installations with drain-back aeration, the check valve shall be below the pitless adapter.

567—49.16(455B) Pitless adapters and pitless units.

49.16(1) Pitless adapters and pitless units conforming to WSC Pitless Adapter Standard—1997 (PAS-97) are considered compliant with these rules.

49.16(2) No well casing shall be cut off or cut into below ground surface except to install a pitless well adapter below the frost level.

49.16(3) A pitless subsurface pipe connection to a well casing pipe shall be made with a weld-on, clamp-on, or bolt-on pitless adapter or weld-on or threaded pitless unit. Aboveground discharge pitless adapters with a drain-back into the well are prohibited on systems under continuous pressure.

49.16(4) If the pitless adapter is gasketed, the opening in the casing shall be sawed to the diameter recommended by the manufacturer with a hole saw and not cut with a torch. The pitless adapter used shall have the correct curvature to fit the diameter of the casing.

567—49.17(455B) Well caps, seals, and vents.

49.17(1) *Caps and seals.*

a. A well cap shall be used on any well not protected by a wellhouse and shall seal tightly against the casing to prevent surface water, dirt, insects, or any foreign matter from entering the well.

b. The well casing shall terminate at least one foot above the finished grade surface.

c. A split-top sanitary seal may only be used on a well terminating within a wellhouse.

d. Any openings in the cap or seal, such as for pump wiring, water depth measurement, or chemical feed, shall be properly grommeted or sealed, except for properly screened and oriented vent openings.

e. There shall be no openings through the well cap except for a factory installed vent, air line chemical feed, and power supply wiring, unless a proposal is submitted to and approved by the administrative authority. To be approved, a proposal shall show that any entrance into the well cap is watertight, prevents surface water from entering the water supply, is secured in position, is only removable with tools, and is resistant to weathering and corrosion.

f. Well pump systems that are not under continuous pressure and have no pressure tank may discharge out of the top of the well if all connections are watertight welds or grommeted openings. Venting, heights, and other cap requirements shall be met.

49.17(2) *Vents.* A well cap used on a well that has a pitless adapter or pitless unit shall have a screened vent hole at least ½ inch in diameter, pointing downward, with not less than 24-mesh noncorrosive screen. Vent openings shall terminate at least 12 inches above finished ground surface. Venting is required on all wells, except Class 3 wells or flowing wells.

567—49.18(455B) Underground piping and wiring.

49.18(1) Underground piping from the well casing to the pressure tank shall be a minimum 100 psi pressure rating, NSF Standard 61, and meet ASTM standards for potable water.

49.18(2) Underground wiring from a well shall either be enclosed in a watertight electrical conduit extending from the entrance of the conduit into the casing to a minimum of three feet below ground level, threaded into the well cap, or sealed into the cap or casing in a watertight manner. The internal passage of the conduit shall be sealed around the wire with a nonhardening, pliable sealing compound.

567—49.19(455B) Filters, water treatment equipment, and sampling faucets.

49.19(1) Filters and water treatment equipment shall be installed and operated in accordance with manufacturers' directions.

49.19(2) In all pressure water systems, provision shall be made for collection of water samples directly from the well by installation of a sampling faucet before the pressure tank, prior to encountering any water treatment equipment.

a. The sampling faucet shall be installed at least 12 inches above the floor, have a downturned spout, and be in an accessible location.

b. All sample faucets shall be metal and have a smooth (nonthreaded) outlet.

567—49.20(455B) Hydropneumatic (pressure) tanks.

49.20(1) *Sizing.* Pressure tanks shall have an effective water volume large enough to allow the well pump to operate at least one minute between low-pressure activation and high-pressure shut off while no water is being

used by the system. The minimum allowable pressure at the pressure tank is 30 psi.

49.20(2) *Constant pressure pump.* Constant pressure/variable speed pumps shall operate at a minimum pressure of 30 psi. Pressure tank size shall be according to manufacturer's recommendation.

49.20(3) *Pressure relief valve.* Tanks shall have a pressure relief valve sized according to the pump capacity, if the pump is capable of developing pressure greater than the working pressure of any system component. The pressure relief valve shall be located prior to any shut-off valve on the distribution system side of the tank.

49.20(4) *Pressure gauge.* Tanks shall have a pressure gauge capable of reading at least 100 psi.

49.20(5) *Tank appurtenances.* If a non-bladder tank is used, it shall be equipped with a means of adding or venting air from the tank to maintain the proper air-water ratio.

49.20(6) *Tank location.* Buried pressure tanks are prohibited. If pressure tanks are not located in a residence or other heated structure, they shall be located in a buried vault or aboveground structure.

a. Buried vault (frost pit). The vault and vault opening shall be sized to allow ease of access for the installation and maintenance of necessary equipment. The vault shall be as watertight as possible, allow for drainage via drain tile or sump pump, and have at least one foot of rock or gravel. above the tile. All wiring in the vault shall be in watertight conduit. No buried vault shall be allowed within a 100-year flood plain.

b. Aboveground structure. The structure and access opening shall be sized to allow the installation and maintenance of necessary equipment. The structure shall be insulated and heated to prevent tank freezing. Structures with concrete floors shall be at least four inches above the surrounding ground and be sloped to a drain or to the door to facilitate drainage of the room. If the structure is located over the well, it shall have a hinged roof or removable hatch over the well or have other provisions for pulling the well pump.

567—49.21(455B) Connections.

49.21(1) *Electrical connections.* At a minimum, all electrical installation shall be performed and maintained in accordance with the current NEC. A certified pump installer may perform wiring from the pump to the electrical panel unless local ordinances require additional licensing.

49.21(2)*Interconnections and cross connections.* No connection between a well or boring and another well, boring, water supply system, any chemical injection, or contamination source is allowed unless the connection is:

a. Protected by an air gap;

b. Protected by a backflow preventer; or

c. Between wells or borings that meet the construction standards of this chapter, are used for the same purpose, and have equivalent quality water supply.

567—49.22(455B) Backflow prevention for chemical injection systems for nonpotable wells.

49.22(1) *Backflow prevention for irrigation.* Where a chemical injection system is connected directly to a well used for irrigation that is not used as a potable water supply, a single-check spring-loaded backflow preventer shall be installed between the point of chemical injection on the pump discharge piping and the well, in accordance with the manufacturer's instructions. The check valve shall withstand a minimum hydraulic pressure of 150 psi without leaking. The backflow device shall be provided with:

a. Valving so that water can be drained from the system to prevent freezing;

b. A vacuum relief valve to prevent backsiphoning of chemicals into the well;

c. An automatic low-pressure drain at least ¾ inches in diameter, positioned so that when draining occurs liquid will flow away from the well. The low-pressure drain shall be at least six inches above grade. The automatic low-pressure drain shall quickly drain the check valve body of water when operation of the well pump is discontinued;

d. A watertight seal around the check valve; and

e. An inspection port four inches in diameter to allow inspection of check valve operation.

49.22(2) *Pump control interconnection.* The well pump and the chemical injection pump shall be electrically connected so that, when the well pump stops, the chemical pump will shut off automatically.

567—49.23(455B) Direct exchange (DX) geothermal systems. The following provisions apply to the construction of DX systems 20 feet or greater in depth.

49.23(1) *General requirements.*

a. All piping and tubing shall be copper and meet the requirements of ASTM B280.

b. All copper fittings shall meet the requirements of the Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings Standard, ASME B16.22-2021, published in 2022.

c. Refrigerant complying with ANSI/ASHRAE 34-2022 shall be used as the heat transfer fluid.

d. A low-pressure automatic shutoff switch shall be installed on all DX systems as a safety device in case of refrigerant leaks.

e. System installation shall adhere to the manufacturer's instructions.

49.23(2) *Corrosion Protection.*

a. All underground DX tubing and piping requires corrosion protection by a cathodic protection system. Cathodic protection systems shall be designed and installed to meet the requirements of NACE SP0169 (2013 Edition).

b. A DX system shall not be installed in areas with acidic soils.

49.23(3) *Drilling and pipe placement.* The entry of foreign material or surface runoff into the open borehole is prohibited.

49.23(4) *Grout.*

a. Grout shall be specified for geothermal applications and mixed according to the manufacturer's specifications.

b. The finished grout shall have:

(1) A hydraulic conductivity of 1*10-7 cm/s or 3.94*10-8 in/s or less, and

(2) A thermal conductivity of 0.71 W/(m * degrees K) or 0.41/btu/hr-ft * degrees F.

49.23(5) *Grouting procedure.*

a. Grouting shall be:

(1) Completed by pressure pumping via tremie pipe from the bottom of the borehole upward in one slow and continuous motion;

(2) Completed to the top of each borehole within 24 hours of borehole completion; and

(3) Checked after 48 hours for subsidence. If subsidence has occurred, grout shall be topped off. This procedure shall be repeated until the requirements of 567—paragraph 48.16(8)*"c"* are met.

b. The tremie pipe shall remain submerged in grout the entire time.

c. If subsidence is occurring due to voids, reference the department's "Geothermal Borehole Void Guidance" document for how to address voids.

49.23(6) *Pipe installation.* All copper piping, tubing, and fittings shall be installed in accordance with ANSI/ASHRAE 34-2022.

49.23(7) *Joints*. Joints shall be brazed with an alloy having 15 percent silver content classified as Type B CuP-5 according to AWS Standard A5.8M/A5.8 (2019).

49.23(8) *Pressure testing.*

a. Each ground loop shall be leak tested using nitrogen gas at pressure of 2170 kPa or 315 psig or by ANSI/ASHRAE 34-2022, whichever is greater, for a minimum of 15 minutes without dropping pressure.

b. Any drop in pressure requires topping off the gas and maintaining pressure for two hours.

c. If the system drops pressure again, the system shall be replaced until the requirements of 567—paragraphs 48.16(9)*"a"* and *"b"* are met.

49.23(9) *Marking underground piping.* All buried piping, including the top of vertical boreholes and the full length of horizontal piping, shall be permanently marked with magnetic tape, magnetic wire, or survey pins to allow for underground detection or utility location at the ground surface.

49.23(10) *As-built documentation.* An aerial, engineering document, or map shall be submitted with the well record form within 30 days of GHEX borehole system installation that indicates the location and GPS coordinates of each vertical borehole, and includes a map of the location of all horizontal piping from the borehole into the building and vault.

567—49.24(455B) Ground heat exchange (GHEX) closed-loop borehole systems. The following provisions apply to the construction of GHEX loop systems 20 feet or greater in depth.

49.24(1) Piping shall be a minimum of 160 psi pressure-rated HDPE and be pressure-tested with air or potable water for 15 minutes at a pressure of 1.5 times the system operating pressure after installation in the borehole.

49.24(2) Connection to piping shall use socket fusion or butt fusion joining methods.

49.24(3) Only potable water or food-grade or USP-grade propylene glycol or calcium chloride may be used as heat transfer fluid.

a. Heat transfer fluids containing additives shall be NSF certified as HT1 in the NSF White Book.

b. Any other materials or additives shall be NSF 60 certified.

c. Additives shall be mixed only in concentrations recommended by the manufacturer.

d. A permanent sign shall be attached to the heat pump specifying the exact mixture of heat transfer fluid contained and stating that only approved heat transfer fluids may be used.

49.24(4) A flow measurement device shall be installed on each system.

49.24(5) Water make-up lines to the vertical heat exchanger shall be protected with a backflow prevention device.

49.24(6) The procedures for grouting, marking underground piping, and as-built documentation in subrules 49.23(5), 49.23(9), and 49.23(10), respectively, shall be followed.

567—49.25(455B) Well disinfection. Wells and water systems shall be disinfected by the contractor following construction completion and whenever any well services are performed.

49.25(1) Prior to disinfection, all new, repaired or rehabilitated wells shall be pumped to waste until the water is free of drilling mud, drill cuttings, and sand, and the water is clear.

49.25(2) A chlorine solution such as a sodium or calcium hypochlorite shall be used for well disinfection. Chlorine compounds shall meet NSF Standard 61 (2016) and have no additives.

49.25(3) Disinfectant shall:

a. Be dispersed throughout the entire water column in the well.

b. Be brought into contact with the inside of the well casing pipe above the static water level, and

Remain in the well for a minimum of two hours if a concentration of at least 100 mg/L chlorine is achieved, or a minimum of 24 hours if at least 50 mg/L is achieved.

49.25(3) For emergency situations, a contact time of a minimum of 30 minutes shall be provided at a chlorine concentration of at least 200 mg/L.

49.25(4) The amount of HTH or household bleach required for a chlorine concentration of 200 mg/L is given in the following table:

Table 49.25(4)
Amount of chlorine disinfectant required for every 25 feet of water in well

Well casing diameter (in inches)	4	6	8	12	18	24	30	36
Amount of pelleted HTH (in ounces containing approx. 70 percent $Ca(OCl)_2$)	0.7	1.5	2.6	5.6	13	23	36	52
Amount of chlorine bleach (in pints containing 5.25 percent NaOCl)	0.5	1.2	2.1	4.7	10.6	18.8	29.3	42.2

49.25(5) Dry disinfectant shall be dissolved in a separate container of water before introduction into the well. The solution shall contain not more than eight ounces of pelleted HTH disinfectant per five gallons of water.

567—49.26(455B) Water sampling and analysis.

49.26(1) The owner of a new, reconstructed, or rehabilitated well shall submit a water sample to a certified laboratory for coliform bacteria and nitrate analysis. The water sample shall be collected at least 10 days after, but not more than 30 days after, a well is put into service following construction, reconstruction, or rehabilitation. The analysis results shall be submitted to the administrative authority.

49.26(2) If the water sample analysis detects the presence of bacteria, the disinfection procedure described in rule 567—49.25(455B) shall be repeated.

567—49.27(455B) Well abandonment. Abandoned wells are a contamination hazard to the water bearing formation as well as a physical hazard for people.

49.27(1) *Plugging rules.* Abandoned wells shall be properly plugged as required in 567—Chapter 39.

49.27(2) *Waste disposal prohibition.* Under no circumstances shall abandoned wells be used for the disposal of debris, solid waste, septic tank sludge or effluents, for any other type of unauthorized disposal of waste materials, or as a receptacle for field tile drainage.

567—49.28(455B) Waivers. Waivers to these rules may be granted by the administrative authority if sufficient information is provided to substantiate equal protection and the need for such action. Waiver requests and reasoning shall be in writing. Waiver approvals or rejections shall also be in writing. Where permitting authority has not been delegated to the county, the department will review and grant or deny any waiver requests within that jurisdiction.

567—49.29(455B) Noncompliance. Violations of any of the provisions of this chapter may be addressed by the department pursuant to Iowa Code sections 455B.109, 455B.110, 455B.175 and 455B.191.

These rules are intended to implement Iowa Code chapter 455B.